

Name: _____

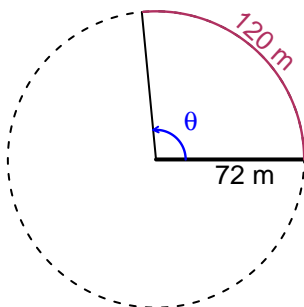
Date: _____

Trig Final (SLTN v657)

- You should have a calculator (like [Desmos](#)) and a [unit-circle](#) reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 120 meters. The radius is 72 meters. What is the angle measure in radians?

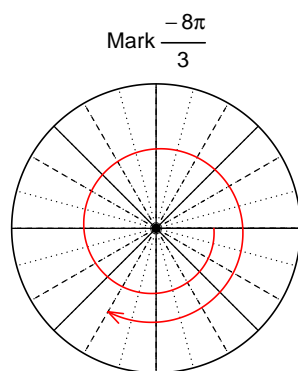


$$\theta = \frac{L}{r} \quad r = \frac{L}{\theta} \quad L = r\theta$$

$\theta = 1.667$ radians.

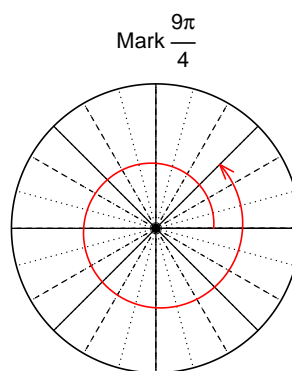
Question 2

Consider angles $-\frac{8\pi}{3}$ and $\frac{9\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(-\frac{8\pi}{3}\right)$ and $\cos\left(\frac{9\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\sin(-8\pi/3)$

$$\sin(-8\pi/3) = -\frac{\sqrt{3}}{2}$$



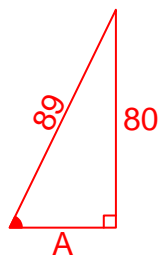
Find $\cos(9\pi/4)$

$$\cos(9\pi/4) = \frac{\sqrt{2}}{2}$$

Question 3

If $\sin(\theta) = \frac{-80}{89}$, and θ is in quadrant IV, determine an exact value for $\cos(\theta)$.

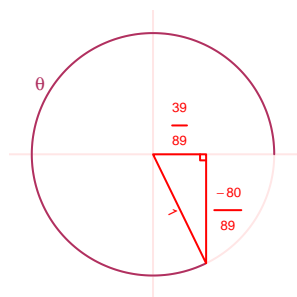
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$\begin{aligned}A^2 + 80^2 &= 89^2 \\A &= \sqrt{89^2 - 80^2} \\A &= 39\end{aligned}$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\cos(\theta) = \frac{39}{89}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 3.8 meters, a frequency of 8.62 Hz, and a midline at $y = 4.96$ meters. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -3.8 \sin(2\pi 8.62t) + 4.96$$

or

$$y = -3.8 \sin(17.24\pi t) + 4.96$$

or

$$y = -3.8 \sin(54.16t) + 4.96$$